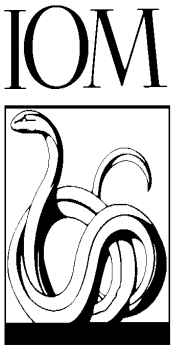
Cancer in Developing Countries of the Pacific Rim

The Current and Future Health Burden

National Academy of Sciences

INSTITUTE OF MEDICINE



Omer Gersten
August 1998

Thanks to providence for leaving me safe, healthy, cared, and lucky enough to pursue gold at the end of the rainbow. I am a believer in the Chinese proverb that “it takes a village to raise a child” and am grateful to all those past and present who shared of themselves with family, friends, and strangers.

The National Academy of Sciences deserves credit for the resources they offered which allowed me to complete this technical report. I hope not to forget that when my dream of an internship in Washington, DC was nearly drained, Andy Pham’s urging eventually led to an indelible, hot and humid summer of my youth.

Omer Gersten
Washington, DC
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Introduction

The first thing one often thinks when hearing the word "cancer" is old age, pain, and death. Although cancer tends to strike at later ages, it also takes the lives of people in their middle years—often a time when they have dependents and are caring for others. In some ways, the outlook for the disease is not as grim as in the past. New technologies and advancements have allowed some countries to better prevent and treat some cancers. Yet, cancer severity has increased in other ways, including for countries of the Pacific Rim who share a common geographic proximity to the Pacific Ocean. These nations vary greatly in such areas as culture and economic condition and include the highly developed countries of New Zealand, Australia, United States, and Japan. The rest are developing countries like Taiwan, Korea, Thailand, and Indonesia that exhibit incredible variety among one another and within their own borders. Given the differences of these developing nations, though, they must still similarly absorb the cancer burden linked to developmental stage, behaviors, and lifestyles.

With the "epidemiologic transition," infectious diseases such as malaria, smallpox, and tuberculosis give way in relative severity to those such as cancer and cardiovascular disease. Although the cancer burden in the Pacific Rim will likely mount, progress can be made to contain it. Some cancers are highly preventable. For example, smoking is the primary cause of lung cancer and if the habit among women in Pacific Rim countries continues to stay low many future premature deaths could be avoided. Some of these countries also have the ability to put in place more extensive and effective screening programs.

After first briefly describing the biology of cancer and methodological issues, this paper goes on to address some of the following questions. What is the current and projected cancer health burden for developing nations of the Pacific Rim? Why is cancer expected to grow worse

in the region? What are some of the main risk factors (with attention to specific cultural aspects of the region) influencing its future severity?

I. Describing Cancer

Hundreds of different forms of cancer exist with widely varying causes. Even with this diversity, all cancers share a common feature: they are the result of unchecked cell division. When cells are in their normal state, they divide and reproduce in a controlled and orderly way. The genes responsible for this smooth functioning of cell growth are called "oncogenes." When the ability of oncogenes to control growth breaks down, perhaps through damage or mutation, uncontrollable cell division and proliferation result. The abnormal cells, cancer cells, which develop through this mechanism can turn into a primary tumor, a cancer that is in the organ of origin. Secondary tumors develop when cancer spreads to distant organs in what is called "metastasis." Cancer's ability to invade and spread to other tissues and organs make it particularly difficult to combat. Only after cancer cells have reached a critical mass are they detectable as a lump (NCAB, 1994; Daly, 1993; IOM, 1984).

II. Method

Cancer's burden can be measured in multiple ways. Traditionally, mortality has been used to quantify the amount of disease and injury. This method is clearly sensible since death is, by and large, an unambiguous event and countries can more easily produce the data required for statistical systems. However, measures of health status other than mortality have been proposed. Some of these measures try to capture different features of health, besides merely that of years

lived, by examining aspects of the quality of one's life. Disability-adjusted life years, or DALYs, is one such measurement that tries to express the "burden of disease." DALYs measure both years of life lost due to premature mortality (YLL) and years lived with disability (YLD). YLL is calculated by subtracting the age of death from the life expectancy of that age in a population with low mortality. YLD weights disabilities on a scale of seven different degrees of severity. Thus, YLL tries to consider the amount of future life a disease has taken away, while YLD attempts to account for significant, but non-fatal illness and disability (IOM, in press). When the DALY measurement is applied to cancers, in contrast to simply mortality, the relative impact of cancer shifts.

The limitations of the currently available data must be noted. Many of the following tables and figures will describe cancer rates, often using deaths and DALYs. The calculation of rates for China and other Asian and Pacific Island countries in 1990 and 2020 uses a significant amount of estimation. Almost all of the developed countries have comprehensive national cancer statistics. However, country specific information in developing countries of the Pacific Rim that meets the rigorous standards of the International Agency for Research on Cancer is almost absent (Parkin et al., 1992). Other, smaller registries, however, such as those that are hospital and population based can provide relatively accurate and informative data (Nielsen et al., 1996; Vestberg et al., 1997). Moreover, independent estimates of cancer rates in various regions of the world lacking complete data are quite similar (Pisani et al., 1993). As with cancer rates, much of the information on smoking is based on less than comprehensive data. Yet, the various data sources are informative, especially when corroborated by other relatively valid sources.

Some of the data presented in this paper is for a group of countries designated as Other Asia and Islands (OAI). For the most part, this grouping represents the developing countries of the Pacific Rim and is listed in Table 1.

TABLE 1 Other Asia and Islands (OAI)

American Samoa	Maldives	Seychelles
Bangladesh	Marshall Islands	Singapore
Bhutan	Mauritius	Solomon Islands
Brunei Darussalam	Midway Island	South Korea
Cambodia	Mongolia	Sri Lanka
Cook Islands	Myanmar	Taiwan
Federated States of Micronesia	Nauru	Thailand
Fiji	Nepal	Tokelau Island
French Polynesia	New Caledonia	Tonga
Guam	Niue	Tuvalu
Hong Kong	North Korea	Vanuatu
Indonesia	North Mariana Islands	Vietnam
Johnston Island	Palau	Wake Island
Kiribati	Papua New Guinea	Wallis and Futuna Islands
Lao	Philippines	Western Samoa
Macao	Pitcairn Island	
Malaysia	Reunion	

III. Current and Future Health Burden

Table 2 describes the impact of cancer in terms of percent of total mortality and total DALYs for three regions, using 1990 data and projections for 2020. The table shows that cancer is very much established in the developed world. In 1990, cancer assumed 22% of all deaths in the region and will rise to nearly a quarter of all deaths there by 2020. In the United States, overall cancer rates peaked and are even declining slightly, although there is no assurance that the emerging trend will continue (Wingo et al., 1998). In various other countries of the European Union a similar pattern is noticeable (Levi et al., 1999). Cancer as a proportion of all deaths is expected to increase even more dramatically in China. By 2020 it is predicted that cancer deaths will make up a greater percent of all deaths in China than in the developed world. The table also indicates that the percent of total DALYs caused by cancers are not as great as that of deaths. There is, though, a correspondence in between deaths and DALYs. China, for instance, has the highest percent of total deaths due to cancer in 2020 (26%) and is also first in DALYs for that year (19%).

For OAI, Table 3 ranks the top ten causes of death projected for 2020, lists the amount of cancer deaths in 1990 and 2020, and provides the percent change between those years. All cancers are predicted to rank second in 2020, only following cardiovascular disorders as the number one killer. Also important is the change in percent of cancer deaths from 1990 to 2020. They are expected to increase by 154%, with only respiratory diseases alone showing a sharper increase. Table 4 shows the top ten causes of DALYs, rather than deaths, in OAI. When measured by DALYs cancers are the fourth, not the second, leading cause of disease burden. China has much the same trends but with some peculiarities. It suffices to say that given its size, one should note whether China is included in the data presented.

TABLE 2 Percent of Total Deaths and DALYs due to Cancer by Region—1990 and 2020*

	Deaths		DALYs	
Region	1990 (%)	2020 (%)	1990 (%)	2020 (%)
Developed World	22	24	14	17
China	16	26	11.5	19
Other Asia and Islands	12	21	5	12

Adapted from: Murray and Lopez, 1996
* Baseline prediction

TABLE 3 Top Ten Causes of Deaths in Other Asia and Islands—2020*, 1990, and Percent Change

	Deaths (thousands)		% Increase (Decrease)
Cause of Death	2020	1990	1990-2020
1. Cardiovascular disorders	2,782	1,349	106
2. Malignant neoplasms	1,627	640	154
3. Infectious and parasitic diseases	670	1,176	(43)
4. Unintentional injuries	596	426	40
5. Digestive diseases	571	315	81
6. Respiratory diseases	419	148	183
7. Respiratory infections	302	552	(45)
8. Intentional injuries	226	133	70
9. Genitourinary diseases	138	98	41
10. Perinatal conditions	97	331	(71)

Adapted from: Murray and Lopez, 1996
* Baseline prediction

TABLE 4 Top Ten Causes of DALYs in Other Asia and Islands—2020*, 1990, and Percent Change

	DALYs (thousands)		% Increase (Decrease)
Cause of Death	2020	1990	1990-2020
1. Neuropsychiatric conditions	28,887	19,206	50
2. Cardiovascular disorders	25,850	17,952	44
3. Unintentional injuries	22,585	21,545	0.05
4. Malignant neoplasms	19,329	8,978	115
5. Infectious and parasitic diseases	16,108	39,588	(59)
6. Digestive diseases	10,749	8,346	29
7. Respiratory diseases	7,085	4,839	46
8. Intentional injuries	6,020	4,045	49
9. Respiratory infections	4,707	15,515	(70)
10. Musculoskeletal diseases	4,287	2,089	105

Adapted from: Murray and Lopez, 1996
* Baseline prediction

IV. Epidemiologic Transition, Population Trends, and Cancer

Knowledge of the epidemiologic transition, the nature of cancer, and population trends in developing countries of the Pacific Rim helps in understanding the previous discussion of cancer's severity. The epidemiologic transition is partly characterized by a shift in the major causes of death. Countries not yet through the transition are struck primarily by infectious, communicable diseases like tuberculosis, malaria, and hepatitis. Mainly through cleaner water and sanitation, immunizations, and established health services, fewer populations are dying from the infectious diseases that strike at earlier ages. In part, life expectancies rise as populations are able to avoid illnesses that claim lives at these earlier ages. This phenomenon increases the chance that people will die from non-infectious, or non-communicable, diseases such as stroke, heart disease, and lung cancer that strike at later ages. In other words, more people are living to ages when non-communicable diseases occur (Omran, 1971). Besides a shift to different types of illness, the epidemiologic transition also broadly applies to situations in which poorer countries adopt behaviors of more industrialized nations. Smoking, diets higher in fat, and sedentary lifestyles are examples of behaviors more prominent in the developed world.

Not only do cancers generally strike at later years, but one's risk of dying from cancer increases exponentially with age (WHO, 1997a). This pattern combined with longer life expectancies in countries undergoing the demographic transition mean they could experience a significant rise in the *number* of cancers without the *incidence* necessarily increasing. That is, more people every year in these countries could die of cancers without the risk of acquiring cancer becoming greater.

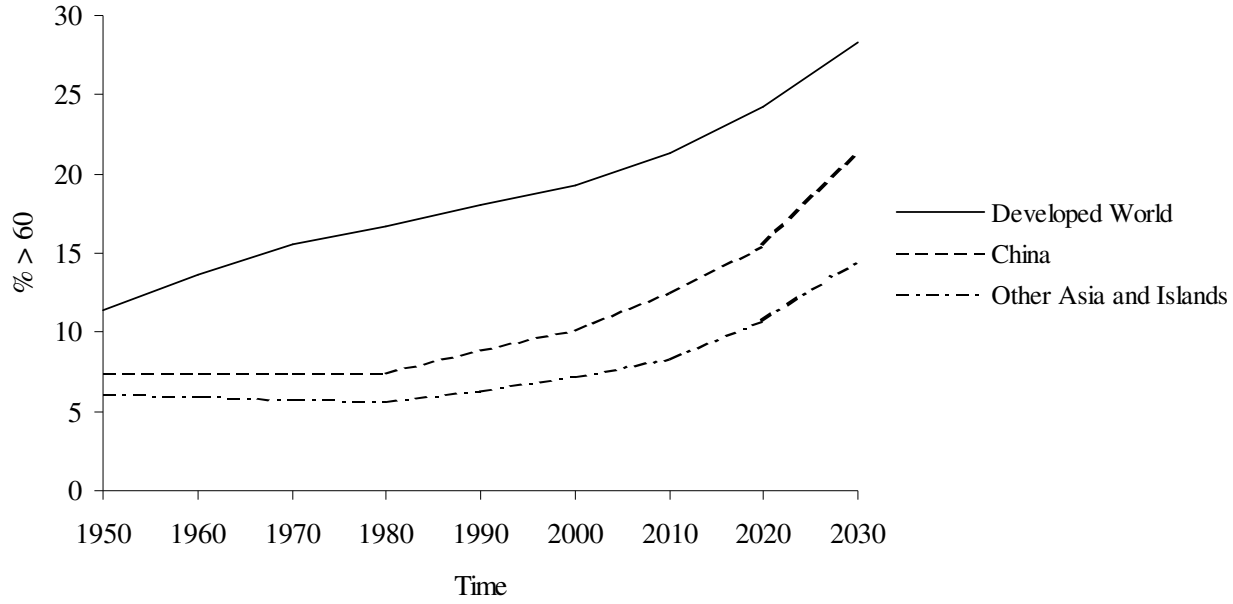
Now that some basic demographic concepts have been elaborated, some specific demographic trends will be presented. Figure 1 shows the aging population in China, OAI, and

the developed world by the percent of people in those countries who are over the age of sixty from 1950-2030. The figure shows that for each region depicted, the percent of those over sixty has been increasing since 1980 and is projected to increase more dramatically in the next thirty years. In China, nearly 7% of the population was over sixty in 1950 and it is predicted that by 2030 the figure will be about one in five persons. OAI has experienced a similar pattern to China, but the rise in OAI's future aging is not expected to be as steep.

Table 5 shows some of the combined effects of demographics and cancer's etiology. It depicts the percent of total cancer deaths in 1990 by sex and by different age groups and regions. The phenomenon of cancer striking at later ages can be observed from this table for all three areas. In males in the developed world, for instance, cancer affects a greater portion of those who are 70+ years old (44%) than compared to those who fall between 60-69 (30%) and especially when compared to the younger age categories. Such a trend holds true for almost every case listed. Another pattern is revealed from the table. Regions that have an older population (see Figure 1) have a greater percent of older people suffering cancer deaths. This makes sense considering that in a younger population, fewer people reach the age when getting cancer is most likely. Thus, when cancer does strike in these populations it attacks someone who is, on average, younger.

Despite cancer being known as a disease of old age, the table shows that it also affects those in the middle years. Even in the developed world nearly one-fifth of those who died were between ages 45-59. Adult deaths can have a particularly negative impact on families, especially when considering their role in providing for dependents both younger and older than themselves. Without adult family members to work and earn the means of support for the other members a particular strain is placed on the families.

FIGURE 1 Percent of Population Over 60 by Region—1950-2030



Adapted from: World Bank, 1993

TABLE 5 Percent of Total Cancer Deaths by Age, Sex and Region—1990

	0-14 (%)	15-44 (%)	45-59 (%)	60-69 (%)	70+ (%)	Total (%)
Other Asia and Islands						
Males	7	10	25	29	29	100
Females	7	15	25	25	28	100
China						
Males	2	12	27	32	27	100
Females	2	14	24	28	32	100
Developed World						
Males	—*	5	21	30	44	100
Females	—*	6	17	25	52	100

Adapted from: Pisani et al., 1993; Murray and Lopez, 1996
* <1%

Tables 2 through 4 suggest that cancers are more severe when measured by deaths rather than DALYs. That is because with the generally late onset of cancers the YLL are not as great relative to causes of death that strike at earlier ages, such as unintentional injury. Further, cancers do not cause the years of disability like neuropschiatric disorders.

V. Specific Cancer Burdens of Pacific Rim Countries

Interestingly, only a few cancers are primarily responsible for the entire cancer burden. Hundreds of different cancers exist, yet Table 6 shows that the top four cancers in men were responsible for 54% of all their cancer deaths and for women the top six accounted for 53% of the total. Also noteworthy are rates that vary by sex. Men, for instance, experience the brunt of cancer deaths. The disparity can partly be explained by the higher rates of smoking among men that lead to more lung and other cancers. Lung cancer was the number one cancer death among men, claiming 64,000 deaths (18%) whereas for women the disease killed 21,000 (8%). Additionally, three of the top ten cancers among women affect only women, with breast and cervical cancer the number one and two killers (Table 6).

Table 7 compares cancer deaths among men in 1990 in three regions. Lung cancer is severe in all areas, ranking as the number one killer in both OAI and in the developed world and third in China. The percent of deaths due to stomach cancer is also striking. It is far higher in China, claiming 23% of all cancer deaths, than in either OAI or the developed world where stomach cancer is about half that figure.

The decline of stomach cancer rates in industrialized nations has been attributed mainly to a general improvement in the standard of living (Howson et al., 1986). Better living conditions appear to reduce the rate of infection of the bacteria *Helicobacter pylori* that gives rise to

stomach cancer (Asaka et al., 1997; Replogle et al., 1996). Much evidence points to protection against the disease conferred by fruits and vegetables. Refrigeration use is also thought to lower stomach cancer rates by keeping fruits and vegetables fresher and by reducing the need to salt, pickle, and cure foods, all risk factors for the disease (Coleman et al, 1993; Muñoz and Franceschi, 1997).

Liver cancer also ranks as a severe problem in China at 23% of all cancer deaths, whereas it is somewhat less so in OAI. Liver cancer in the developed world, on the other hand, is relatively uncommon. High rates of hepatitis B and hepatitis C, mainly responsible for bringing about liver cancer, explain some of the high liver cancer death rate in OAI and China. Regarding hepatitis B virus in 1997, more than 7% of the population were carriers in China and in most countries of OAI. In contrast, in the United States in the same year fewer than 2% had the virus. For hepatitis C at about the same time, approximately 2.5-4.9% of Chinese and 1-10% of those in OAI were carriers (WHO, 1998).

TABLE 6 Top Ten Cancer Deaths in Other Asia and Islands by Sex—1990

Men			Women		
Cause of Death	Deaths (1,000s)	% Total	Cause of Death	Deaths (1,000s)	% Total
1. Lung**	64	18	1. Cervical*	33	12
2. Liver	49	14	2. Breast*	28	10
3. Mouth-pharynx	42	12	3. Mouth-pharynx	26	9
4. Stomach	37	10	4. Lung**	21	8
5. Colo-rectum	21	6	5. Stomach	20	7
6. Leukemia	17	5	6. Colo-rectum	19	7
7. Esophagus	15	4	7. Liver	18	6
8. Lymphomas***	15	4	8. Leukemia	14	5
9. Prostate*	13	4	9. Ovary*	11	4
10. Bladder	8	2	10. Lymphomas***	10	4
Other	80	22	Other	80	29
Total	361	100	Total	280	100

Adapted from: Murray and Lopez, 1996
*Affects all, or nearly all, of that sex
**Includes trachea and bronchus cancers
***Includes multiple myeloma

TABLE 7 Top Ten Cancer Deaths in Men in Other Asia and Islands, China, and the Developed World—1990

Other Asia and Islands		**China**		**Developed World**	
Cause of Death	% Total	Cause of Death	% Total	Cause of Death	% Total
1. Lung**	18	1. Liver	23	1. Lung	30
2. Liver	14	2. Stomach	23	2. Stomach	11
3. Mouth-pharynx	12	3. Lung	16	3. Colo-rectum	10
4. Stomach	10	4. Esophagus	14	4. Prostate	8
5. Colo-rectum	6	5. Colo-rectum	5	5. Pancreas	4
6. Leukemia	5	6. Leukemia	4	6. Lymphomas	4
7. Esophagus	4	7. Mouth-pharynx	3	7. Bladder	3
8. Lymphomas***	4	8. Pancreas	2	8. Leukemia	3
9. Prostate*	4	9. Lymphomas	2	9. Esophagus	3
10. Bladder	2	9. Bladder	2	10. Mouth-pharynx	3
Other	22	Other	6	Other	19
Total	100	Total	100	Total	100

Adapted from: Murray and Lopez, 1996
*Affects all, or nearly all, of that sex
**Includes trachea and bronchus cancers
***Includes multiple myeloma

One anomaly in Table 7 is the high rate of esophagus cancer in China. The disease accounts for only a small percentage of cancer deaths in OAI and the developed world. China is part of the "oesophageal cancer belt" in which high rates are suspected to be due to micronutrient deficiencies (WHO, 1997a). Both China and the developed world have noticeably lower rates at 3% of all cancer deaths. As will be explained in the section on tobacco, the high rate of mouth-pharynx cancers in OAI can be attributed to the habit of chewing betel quid. Lastly, colo-rectal cancers are slightly higher in the developed world at 10%, compared to 5% in China and 6% in OAI. Colo-rectal cancer is an example of a cancer that tends to strike affluent countries more severely.

For women in the three regions, similar rates as those described for men exist for cancers of the stomach, colo-rectum, mouth-pharynx, liver, and esophagus. Also, the three cancers that afflict women only (breast, cervical, and ovary) rank within the top ten for each region.

VI. Cancer Risk Factors

Cancer is not caused by a single factor, such as genetics or smoking, but by many. Table 8 helps provide perspective on the varying contributions of these risk factors. It presents different groups of cancer risk factors along with their estimated contribution to the onset of cancer. Clearly, the estimates differ for any individual person, populations, and specific cancers and some disagreement surely surrounds estimates of this type. According to the table, genetics cause only about 10% of cancers. For example, there is such a condition called ataxiatelangiectasia, involving translocation of genetic material to chromosome 14, which is associated with increased risk for leukemia, lymphoma, gastric cancer, liver cancer, and ovarian cancer (Daly, 1993). Given these cases, the role of non-genetic factors is nonetheless substantial. For example,

migrants moving from low-risk cancer areas to those with higher risk will often experience dramatic increases in the chance of acquiring cancer in a period as short as ten years. Moreover, after a few generations in the new country, descendants of the former migrants will often take on cancer rates similar to that of the rest of the country (IOM, 1984).

Diet, including obesity and sedentary lifestyles, and tobacco in all of its forms are the two most important risk factors. These two alone combine to cause nearly 70% of all cancers. The fourth risk factor is reproductive and sexual behavior that can increase the chance of acquiring cancers that stem from sexually transmitted infections. For instance, being infected with HIV significantly increases the chances of acquiring the very rare Kaposi's sarcoma. The sarcoma is 20,000 times more likely in HIV infected individuals than in the general population (Beral et al., 1991). The human papilloma virus, also transmitted sexually, is a causal factor in cervical cancer (WHO, 1996).

Of all cancer deaths, about 2-8% can be attributed to dangerous occupations and working conditions. Two such occupations are alcohol manufacture via the strong-acid process of isopropyl and nickel refining (Daly, 1993). Alcohol, which ranks as the sixth leading risk factor, is implicated in about 3% of all cancer deaths. It acts synergistically with tobacco in cancers of the mouth-pharynx, larynx, and esophagus. Geophysical risk factors include UV radiation, which is a cause of skin cancer, and radon, which comes naturally from the ground and can collect in enclosed places. Pollution in different forms may account for some 2% of all cancer deaths. Medical procedures, such as those causing exposure to diagnostic radiation, and medicines are relatively less important risk factors in explaining the total cancer burden.

TABLE 8 Causes of Cancer Mortality

Risk Factors	% of All Cancer Deaths	
	Best Estimate	Range of Acceptable Estimates
1. Diet*	35	10-70
2. Tobacco	30	25-40
3. Genetic factors	10	5-20
4. Reproductive and sexual behavior	7	1-13
5. Occupation	4	2-8
6. Alcohol	3	2-4
7. Geophysical factors	3	2-4
8. Pollution	2	1-5
9. Medicines and medical procedures	1	0.5-3
Other	5	—
Total	100	100

Adapted from: Daly, 1993
*Includes obesity and sedentary lifestyle

VII. Tobacco

Tobacco consumption in its various forms represents the most preventable cancer causing behavior. Diet also plays a large role, but no singular dietary change can decrease one's risk as much as abstaining from tobacco. Tobacco comes mainly in the smokeless and smoked forms. Chewing tobacco and betel quid chewing, which is especially popular in Southeast Asia, are two popular smokeless forms. Chewed betel quid is a mixture of areca nut, tobacco leaf, buyo leaf and lime. Chewing betel leads to oral cancers since it is often left as a cud tucked in the cheek for long hours. The practice is especially common in Vietnam, Laos, Thailand, Malaysia and the Philippines, and explains the higher rates of mouth-pharynx cancers in OAI found in Table 7 (Armstrong, 1985). Betel chewing is more common among poorer people in rural areas and the habit is giving way to cigarette smoking among those who are younger.

Table 9 lists smoking rates for different countries in the Pacific Rim and, for comparison, the United States. In Pacific Rim countries the disparity between female and male smokers is great. Of the countries listed, the smoking rate among men is not less than 40%, with the habit particularly widespread in Cambodia, Vietnam, and South Korea. In almost all of the Pacific Rim countries presented, about 5% of women are smokers. In many of these countries a social stigma is attached to women who smoke. In China, for instance, such women are still often associated with prostitutes (Zhu et al., 1992).

Smoking trends in some of these Pacific Rim countries may be following a pattern witnessed in the United States earlier this century. Men in the United States during the early 1900s began smoking in much greater rates than women, but female smoking rates began to catch up in the 1920s and 1930s (Koong et al., 1990). While smoking rates among women have dipped since then, 23% of adult women smoked in 1993, a rate exceeding that of all but one of

TABLE 9 Smoking Rates in the United States and Selected Countries of the Pacific Rim

Country	Male Smoking Rate (%)	Female Smoking Rate (%)	Adult (15+) Population (millions)**	Study Year	Study Description
United States	44	32	—	1970	National surveys of those age 18+. Figures of daily and occasional smokers.
United States	28	23	202	1993	National surveys of those age 18+. Figures of daily and occasional smokers.
China	61	7	898	1984	Prevalence survey of those age 15+.
Indonesia	54	3	132	1980	National Household Survey of those age 10+. Figures represent daily smokers.
Vietnam	73	4	46	1995	Survey of 2,000 persons in Hanoi, Ho Chi Minh City and two rural areas of age 18+.
Philippines	43	8	41	1987	National prevalence study.
Thailand	49	4	42	1995	*
South Korea	68	7	34	1989	*
North Korea	42	*	17	1985	*
Malaysia	41	4	12	1986	*
Cambodia	80-90	2-10	6	1990s	*
New Guinea	46	28	3	1990	National survey.

Adapted from: WHO, 1997b
* No information given
**1995 Figures

the Pacific Rim countries listed (Table 9). In China, the influence of western habits, as evidenced by such things as dress and popularity of Western music, is feared to likely influence attitudes about smoking (Koong et al., 1990). Also, in one study of adolescent smokers, Chinese junior high school girls listed "current fashion" as the number one reason for smoking, indicating that smoking may becoming popular (Zhu et al., 1992). In South Korea, changing values and increasing economic affluence in the 1980s may have contributed to the rise in smoking seen there (Jee et al., 1998). From 1945 to 1995, the aggregate tobacco consumption in South Korea increased 8.6 fold while the population increased only 1.5 fold (Jee et al., 1998). Thus, despite recent signs of an impending shift in female patterns of smoking, the habit is currently not widespread.

The percent of worldwide cancer cases in 1985 attributable to smoking is estimated in Table 10. The behavior puts one at the greatest risk for lung cancer, with, worldwide, 85% of lung cancers in men and 46% in women explained by smoking. Put another way, lifetime smokers have on average a 20-30 times greater risk of acquiring lung cancer than non-smokers (WHO, 1997a). Even those who are not smokers themselves but are consistently exposed to second hand tobacco smoke, or "passive smokers," have a 30-50% greater chance of getting lung cancer compared to non-smokers (WHO, 1997a). Cancers of the esophagus, mouth-pharynx, kidney, bladder, and pancreas are also more likely in smokers. Perhaps about 45% of cancer cases of the esophagus in men are due to the behavior (Table 10).

Figure 2 highlights the role of smoking by region in lung cancer's onset. In North America, where smoking has been most established, 93 and 82% of lung cancer cases can be attributed to smoking in men and women, respectively. As expected, the corresponding figures for China, Southeast Asia, and Other East Asia are all lower, although in men they are relatively

close to the North American percentage. Figure 3 is similar to the previous one except that it shows the percent of all cancers, not just lung cancer, attributable to tobacco smoking.

Kicking the smoking habit is difficult. In China giving cigarettes to people is considered a courtesy. This special function of tobacco in social interaction will undoubtedly be a major barrier to anti-smoking efforts there (Zhu et al., 1992). Smoking is in other ways very much engrained in the Pacific Rim. According to a 1987 survey in the Philippines, 38% of the physicians who responded said that they smoked in front of their patients and some 41% of survey respondents did not advise patients on the ill-effects of smoking (WHO, 1997b). Quitting is especially difficult considering the addictive properties of nicotine. In the United States, approximately 70% of smokers express a desire to stop. About half of smokers attempt to quit each year, but only 2.5% succeed (IOM, 1998). The desire to quite smoking also is present in at least some countries of the Pacific Rim. In 1990, 69% of smokers questioned in South Korea "wanted to quit," up from 58% in 1988 (WHO, 1997b).

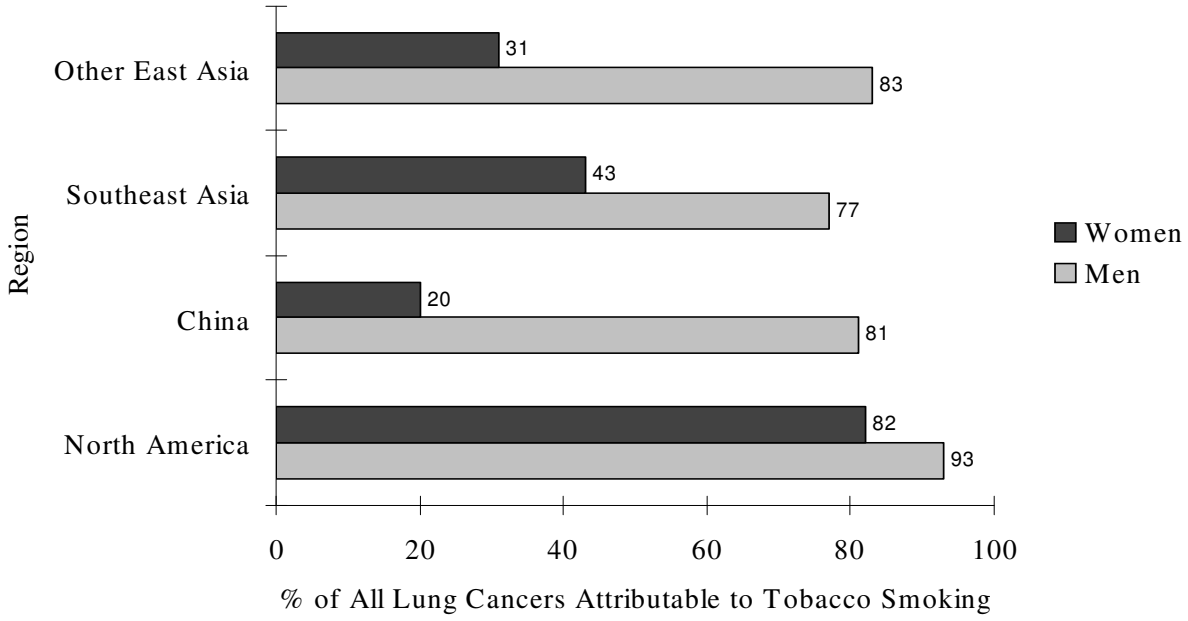
Some public actions have proven effective in reducing smoking rates. These include increasing prices, banning different forms of tobacco advertising, and banning smoking in public places (IOM, 1998). Without a social stigma against smoking and a legislative framework that makes it expensive and a hassle, the difficulty in lowering smoking rates that are already established is great. Many measures cannot be implemented with full effectiveness because of the enormous, opposing pressures that come from areas such as agricultural and finance ministries and tobacco companies. As an illustration, Taiwan was obliged to open its markets to foreign tobacco interests as part of its involvement in General Agreement on Tariffs and Trade (GATT), a move that will most likely compromise domestic public health efforts (IOM, 1998).

TABLE 10 Percent of Cancers* Attributable to Smoking—1985

	Men (%)	Women (%)
Lung	85	46
Esophagus	45	11
Mouth-pharynx	41	11
Kidney	39	4
Bladder	37	14
Pancreas	27	11

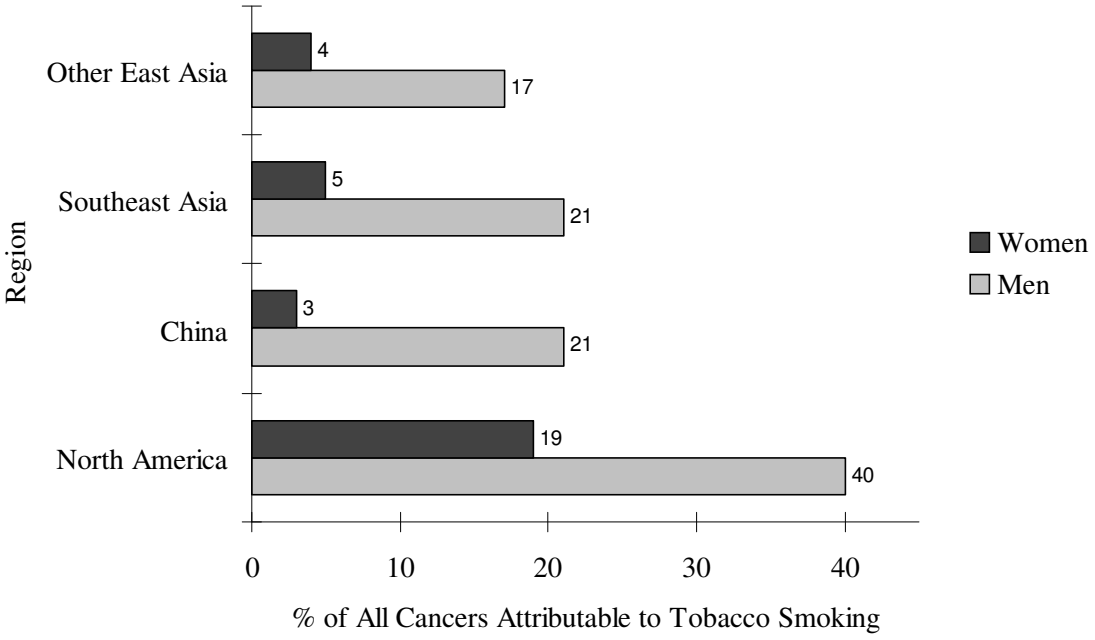
Adapted from: Parkin et al., 1994
* Worldwide estimate

FIGURE 2 Percent of All Lung Cancer Attributable to Tobacco Smoking



Adapted from: Parkin et al., 1994

FIGURE 3 Percent of All Cancer Attributable to Tobacco Smoking



Adapted from: Parkin et al., 1994

VIII. Cancer Transition

Cancer is neither a developing nor a developed world disease. As nations industrialize, they experience different forms of cancers. More affluent countries experience a greater percent of cancers of the breast, prostate, and colo-rectum. Lung cancer rates generally increase with the affluence of a country, partly due to more disposable income to buy cigarettes (WHO, 1997b). Interestingly, industrialized countries are better able to treat some of the very cancers their wealth brings about. For example, while breast cancers are more common in these countries, the developed nations are also better able to support the extensive screening programs required to detect the illness. Additionally, the technologies to treat breast cancer are often more effective and available in developed countries (Mittra, 1995; Wolstenholme et al., 1998). Not only is it typical to see lung and breast cancer rise in a cancer transition, but stomach and liver cancer often drop markedly. As explained in the previous section, stomach cancer deaths are thought to be reduced mainly through improved food preservation and standard of living, while liver cancers decline most significantly with the control of hepatitis B and hepatitis C.

Table 11 shows known associations between dietary components and specific cancers involved in the transition. For all cancers listed, the table depicts protection conferred by eating fruits and vegetables. A study of the relationship between diet and colo-rectum cancers in China further confirmed the link between vegetables, especially green vegetables, and lower risk (Hu et al., 1991). The popularity of vegetables in China was illustrated in one study which found that 78% of Chinese surveyed consumed dark green vegetables at least twice a week (Forman, 1992). Table 11 also shows that fat and body weight and calories increase the risk of cancers of the breast, prostate and colo-rectum. Numerous studies have shown that total protein, fat, and caloric intake are significantly lower in less developed compared to developed countries. Rice, for

instance, is the most important staple in Taiwan, providing 40% of the total calories. In contrast, hamburgers lead the calorie food list in the American diet (Pan et al., 1992). Sedentary lifestyles are less common in the Pacific Rim and in China the bicycle is still the main form of transportation (Chow et al., 1993).

According to the table, increased fiber intake by eating foods such as chives, celery, or grains lowers the risk of colo-rectal cancer. As has already been mentioned, eating smoked, salted, and pickled foods is associated with an increase in stomach cancer. Home refrigeration may reduce practices of salting and pickling. A weak negative correlation between duration of refrigerator use and salt preference was shown in one study of Chinese (Lee et al., 1995). Not only do home refrigerators preserve fresh foods, more fruits and vegetables may be consumed year round because they can be kept frozen. Increased consumption of such foods would likely result in a greater intake of vitamins C, E, and A (Howson et al., 1986). Thus, developing countries of the Pacific Rim are partly characterized by generally healthier diets and a less sedentary lifestyle compared to their developed neighbors. Other factors in addition to these contribute to the pattern among developing countries of relatively higher liver and stomach cancer rates, and relatively lower rates of breast, lung, and other cancers.

TABLE 11 Relationship Between Selected Dietary Components and Cancer

Cancer Site	Fat	Body Weight & Calories	Fiber (grains)	Fruit and Vegetables	Alcohol	Smoked, Salted, and Pickled Foods
Breast	+	+		-	+	
Prostate	+	+		-		
Colo-rectum	+	+	-	-		
Stomach				-		+

Key: + = Positive association (increased intake with increased cancer)
- = Negative association (increased intake with decreased cancer)

Adapted from: NCAB, 1994

Conclusion

Cancer is established in developing countries of the Pacific Rim. To address the problem, policy changes and investment in health and social capital need to take place. Unfortunately, lack of resources and in some cases political will make this difficult. The limited means that do exist should be concentrated in areas of prevention, rather than in acute care, to yield the greatest return. Smoking is the number one preventable cause of cancer and smoking rates among women in developing countries of the Pacific Rim are still relatively low. The opportunity to keep them low exists and if acted upon could save an untold amount of premature deaths. Control of hepatitis, a cause of liver cancer, and screening for cervical cancer are two other proven and cost effective measures to combat this disease.

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